Name: __________ Date: __________

Polynomial Operations SOLUTION (version 224)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) = -5x^5 + 8x^4 - x^2 - 4x - 7$$

$$q(x) = 10x^5 - 6x^3 - 8x^2 - 7x - 3$$

Express the sum of $p(x) + q(x)$ in standard form.

Get "unsimplified" forms. Then find $p(x) + q(x)$ with addition/subtraction.

$$\begin{aligned}
p(x) &= (-5)x^5 + (8)x^4 + (0)x^3 + (-1)x^2 + (-4)x^1 + (-7)x^0 \\
q(x) &= (10)x^5 + (0)x^4 + (-6)x^3 + (-8)x^2 + (-7)x^1 + (-3)x^0 \\
p(x) + q(x) &= (5)x^5 + (8)x^4 + (-6)x^3 + (-9)x^2 + (-11)x^1 + (-10)x^0 \\
p(x) + q(x) &= 5x^5 + 8x^4 - 6x^3 - 9x^2 - 11x - 10
\end{aligned}$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) = 7x^2 + 3x - 5$$

$$b(x) = 5x + 3$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$7x^2$	$3x$	-5
$5x$	$35x^3$	$15x^2$	$-25x$
3	$21x^2$	$9x$	-15

$$a(x) \cdot b(x) = 35x^3 + 15x^2 + 21x^2 - 25x + 9x - 15$$

Combine like terms.

$$a(x) \cdot b(x) = 35x^3 + 36x^2 - 16x - 15$$

3. Express $(x + 1)^6$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^6 + 6x^5 + 15x^4 + 20x^3 + 15x^2 + 6x + 1$$

Polynomial Operations SOLUTION (version 224)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= -4x^3 + 25x^2 + 21x - 1 \\ g(x) &= x - 7 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x-7}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

	-4	25	21	-1
7		-28	-21	0
	-4	-3	0	-1

So,

$$\frac{f(x)}{g(x)} = -4x^2 - 3x + \frac{-1}{x-7}$$

In other words, $h(x) = -4x^2 - 3x$ and the remainder is $R = -1$.

5. Let polynomial $f(x)$ still be defined as $f(x) = -4x^3 + 25x^2 + 21x - 1$. Evaluate $f(7)$.

You could do this the hard way.

$$\begin{aligned} f(7) &= (-4)\cdot(7)^3 \ + \ (25)\cdot(7)^2 \ + \ (21)\cdot(7) \ + \ (-1) \\ &= (-4)\cdot(343) \ + \ (25)\cdot(49) \ + \ (21)\cdot(7) \ + \ (-1) \\ &= (-1372) \ + \ (1225) \ + \ (147) \ + \ (-1) \\ &= -1 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(7)$ equals the remainder when $f(x)$ is divided by $x - 7$. Thus, $f(7) = -1$.